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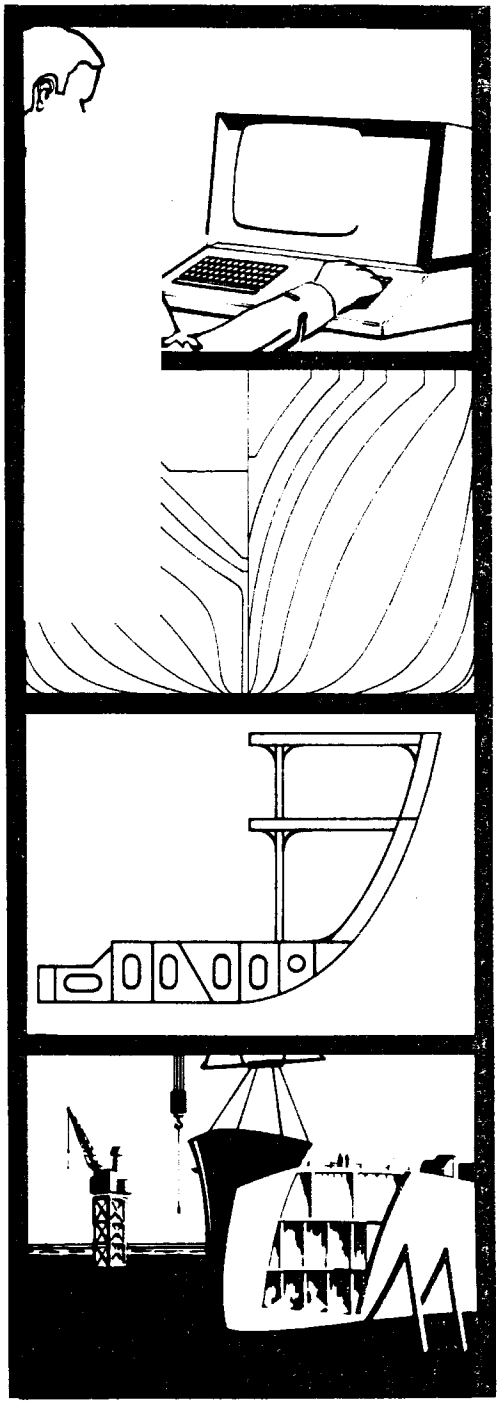

R ESEARCH
AND
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FOR
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AND
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IN
S HIPBUILDING

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SPADES' PROGRESS IN SHIPBUILDING

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New Orleans, Louisiana

Mr. Nuzzo is the Assistant Superintendent of the Mold Loft and Director of Numerical Control. He has 24 years of experience in the mold loft at Avondale and has spent the last ten years in developing the usage of numerical control.

Presently, Mr. Nuzzo serves as the Chairman of the SPADES Users Steering Committee.

In the past 3½ years, the SPADES System has proven itself to be a viable, effective design and shipbuilding tool. This system is now being used by 4 major shipyards in the United States:

Avondale Shipyards, Inc.
National, Steel and Shipbuilding Co.
Lockheed Shipbuilding and Construction Co.
Livingston Shipbuilding Co.
McDermott Shipbuilding Co.
(dormant at this time)

Not only does SPADES serve as a host system for these yards, but it is also utilized by Cali and Associates service group to fair hull lines, do design calculations and the N.C. lofting work for several small U.S. shipyards.

The SPADES system has been used to construct various types of ships and steel structures:

Shipbuilder: Avondale Shipyards, Inc.
Type/Class of Vessel:
86,000 DWT 'EXXON' San Francisco Class
125,000 M3 LNG Methane Delta Class
164,000 DWT 'SOHIO' Class Oil Tanker
56,000 DWT Product Tanker
*LASH Cargo Vessel
ODECO Semi-Submersible Oil Rig
SEDCO Drill Rig
WESTERN Drill Rig
ZAPATA Drill Rig
300 Ft. Oil Barge
300 Ft. Deck Barge
450 Ft. Deck Barge
470 Ft. Deck Barge
195 Ft. Chemical Barge
Offshore Tank Barge
500 Ft. Ore Carrier Barge
900 Ft. Floating Dry Dock
AO Class Navy Oilers

Shipbuilder: National Steel and Shipbuilding Co
Type/Class of Vessel: 190,000 DWT 'SAN DIEGO' Class
AD Class Navy Destroyer Tender

Shipbuilder: McDermott Shipbuilding Co.
Type/Class of Vessel: 126 Ft. Harbor Tug

Shipbuilder: Lockheed Shipbuilding and Construction Co.

Lofted by: Lockheed Shipbuilding and Construction Co. and Cali and Associates, Inc.

Type/Class of Vessel: AS-39 Class Sub Tender

Shipbuilder: Livingston Shipbuilding Co.

Lofted by: Livingston Shipbuilding Co. and Cali and Associates, Inc.

Type/Class of Vessel: GLOMAR 40 Class Drill Ship
DIAMOND 'M' Class Jack-up Rig
429 Ft. x 65 Ft. x 21 Ft. 6 in. product Carrier

Lofted by: Cali and Associates for,

Atlantic Marine, Inc.

Type/Class of Vessel: 79 Ft. Stock Trawler

Kings Craft Corporation

Type/Class of Vessel: 75 Ft. Aluminum Home Cruiser

Marinette Marine Corp.

Type/Class of Vessel: LCU-1671 Class Landing Craft
LCM(6) Class Landing Craft
T-ATF Fleet Tug
36 Ft. Mini-ATC
150 Ft. 'ARTUBAR' Tug Boat

McDermott Shipyard

Type/Class of Vessel: 180 Ft. x 40 Ft. x 14 Ft. Offshore Supply Vessel

Peterson Builders, Inc.

Type/Class of Vessel: 178 Ft. Patrol Gunboat (PPG 1)

Service Machine and Shipbuilding Co.

Type/Class of Vessel: 136 Ft. Supply Tug

Steiner Shipyard

Type/Class of Vessel: 75 Ft. Stock Trawler

Tacoma Boatbuilding Co.

Type/Class of Vessel: 106 Ft. U.S. Navy Sewage Waste Offloading Barge
140 Ft. U.S. Coast Guard WYTM Cutter

Tampa Ship Repair and Dry Dock Co.
Ingalls Iron Works Co.

Type/Class of Vessel: 13,500 DWT Bulk Coal Barge

Toche Enterprises-Div of Vickers Enterprises

Type/Class of Vessel: 121 Ft. Tug Boat
170 Ft. Offshore.Supply Vessel

The major shipyards that utilize SPADES and Cali and Associates have organized a user group. Annual two-day SPADES user meetings are held in January of each year to discuss problems and improvements to the system. The SPADES steering committee meets just after the user meeting and again in June (in conjunction with the REAPS meeting) to make official decisions on problems improvements or changes. At these sessions, priorities for Cali and Associates to work toward are established. A problem identification form and a suggestion and improvement form were designed and adopted with a procedure for informing Cali and Associates and all SPADES users about changes or problems within the system. Cali and Associates assigns a unique identification number to these forms and submits comments. The Steering Committee serves as a catalyst to Cali and Associates for constant improvement of the SPADES System.

Since the original introduction at one of the earlier REAPS Symposium's some new features added to SPADES include:

PART GENERATION

A Sub* command which allows the coder to store a routine or operation for later recall by other programmers. This is a powerful tool when used in conjunction with other new features in the system to eliminate duplication of programming effort.

Logical if's, jump and entry commands allow the coders to perform check operations and shorten programs. This provides the capability of doing things in the SPADES System that could only have been accomplished with FORTRAN.

PTNO, the save point routine under an identification number for-later recall,was expanded to allow for 500 points. In addition,all points are in the data base with x, y and z coordinates for easy use in any view.

Three dimensional commands such as distance 2 allows us to save the distance between two x,y and z points in space, and a triangulation routine now enables the coder to develop any

odd contoured parts other than shell plate and decks which are already a part of the System.

Expansion factors automatically expand the part in the x,y or z dimension to allow for shrinkage due to welding.

Part separation allows the programmer to do an entire bulkhead, web, deck, etc., and later use part separation to add the seams as indicated on the Engineering drawings.

The use of skewed planes has been expanded. We can now call a plane through the hull lines at waterlines, buttocks or skewed at any angle and also get the intersection on that plane with loaded stringers and loaded surfaces such as decks, longitudinal bulkheads, girders. This feature was especially established to handle CANT frames.

The template option will provide end cut templates for stiffeners, both Web and Flange from the drafting machine for stiffeners and longitudinals. These templates are used in conjunction with the frame bending output for formed members.

The SPAC module is a production control development. This keeps track of stiffener lengths, part weights, centers of gravity, templates and burning information by assembly.

NESTING

Automatic center punching and hole commands let the system decide on the best sequence for these operations on burning tapes.

Tabs are programmed into burning tapes with tabs on holes generated automatically according to the hole size.

Tape weld feature allows the nester to shift a contour on a part to allow for the gap necessary for Tape Welding.